A Unique Case of Ectopic Kidney with Variant Vasculature: A Congenital Anomaly Masquerading as Pyelonephritis

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Abstract
There are several documented cases of ectopic and kidneys with supernumerary vasculature. However, we report a unique case of ectopic kidney with the right renal vessels originating from the left common iliac arteries as demonstrated by a contrast Abdomino-pelvic CT scan. The patient was at first clinically diagnosed with acute pyelonephritis.

Keywords: Ectopic Kidney, Embryological variations, Pyelonephritis

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1. INTRODUCTION
Pyelonephritis is an infection of the Kidney that may be caused by bacteria, trauma or rarely Viruses (Brown et al., 2005). This condition presents as a combination of fever, vomiting and pain over costovertebral area (Brown et al., 2005). It is a straight forward condition to diagnose if the clinical presentation is classical. However, several conditions may mimic pyelonephritis such as appendicitis, adnexal mass, intestinal obstructions and reproductive health diseases such as ectopic pregnancy. The numerous number of differential diagnosis requires a confirmatory test such as a CT scan.

2. THE CASE
A female patient aged 18 years old presented to the hospital with pain in the abdominal region for more than a week. On physical examination, she had a tender swollen mass in the right iliac fossa. Her vital signs were within the normal limits. A contrast abdomino-pelvic CT scan was ordered. Following administration of intravenous contrast, axial images of the abdomen and pelvic viscera were obtained in the portal venous phase. Supplemental 2D reformatted images were generated and reviewed. The left kidney was within normal limits but the right was positioned towards descending aorta (midline) and lower pelvic. Its upper pole corresponded to L3 level, whilst the right renal vessels originated from the left common iliac arteries.
The right ureter was normal (no stones or calculi) but shorter in length (Figure 1). The scan indicated right ectopic kidney with no evidence of pyelonephritis.

**Fig. 1:** transverse section of CT pelvis/Abdomen with contrast imaging showing 2D formatted images of right kidney positioned towards the midline.

### 3. DISCUSSION

An ectopic kidney is a congenital anomaly where the kidney is abnormally placed away from its normal anatomical position. It is a relatively rare condition but commonly none life threatening (compatible with life). The anomaly may be a unilateral or a bilateral condition associated with other variations in urogenital organs (Costumbrado *et al.*, 2017).

**Fig. 2:** An illustration of ectopic Kidney with a variant vasculature and a short ureter (adapted from www.niddk.nih.gov)
As the kidneys develop, its position changes greatly. Initially the metanephric kidneys lie close to each other in the pelvis ventral to the sacrum (Vize et al., 2003). As the abdomen and pelvis grow, caudal to the kidneys, so that they occupy more cranial level. They gradually come to lie in the abdomen and move farther apart and attain their adult position by 9th week. Initially the hilum faces ventrally, however, as the kidney ascends it rotates medially 90 degrees. By the 9th week the hilum is directed anteromedially. As the kidney ascends to its usual anatomical position it may be felt in the pelvic, lumbar, abdominal, retro-aortic or pre-aortic position thus become ectopic (Fig. 2) (Scott et al., 2016).

In normal embryological development, the growing kidneys receives blood from a plexus of arteries called the rete arteriosum urogenitale (Giavroglou & Kokkinakis, 2005). The rete plexus corresponds to the mesonephric branches along the whole line of the mesonephros. This arterial plexus later fuse together to supply both the primitive urinary and reproductive system. Failure of fusion of this plexus may lead to supernumerary renal arteries (Budhiraja et al., 2013; Sasikala and Singh, 2017).

The position of the newly formed renal vasculature then changes with gestational age. Initially, the renal arteries are branches of the common iliac arteries (Dressler, 2006). As they ascend, they receive their blood supply from the distal end of the aorta. Then, they receive new branches from the aorta. When they come into contact with the suprarenal glands in the 9th week their ascent stops. Normally, the caudal branches undergo involution and disappear. The right renal artery is longer and often more superior (Dressler, 2006).

**Figure 3:** transverse section of CT pelvis/Abdomen showing anomalies in the distribution of renal arteries (the right renal vessels originated from the left common iliac arteries)

In the current case, the right renal vessels originated from the left common iliac arteries (Fig. 3), an extremely rare anomaly reported in few case studies (Giavroglou & Kokkinakis, 2005; Isoda et al., 2002; Jeffery, 1972). This anomaly may be associated with either ectopic kidneys, or when the right and left kidneys are too close during their ascent thus the rete plexus get mixed up.

**4. REFERENCES**


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